

CLEAN VERSION OF AMENDED CLAIMS

*E1* *5/27/97* 1. (four times amended) A method for packaging a semiconductor die to form a semiconductor package comprising:  
providing a leadframe configured for wire bonding to the die;  
providing a cyanoacrylate adhesive material formulated to cure in contact with the die in less than about 60 seconds in a temperature of about 20°C to 30°C and an ambient atmosphere;  
providing a filler in the adhesive material selected to tailor a characteristic of the package;  
applying the adhesive material to the leadframe or to the die;  
placing the die on the leadframe with the adhesive material in contact with the die and the leadframe to form an adhesive layer therebetween; and  
curing the adhesive material in the temperature and the ambient atmosphere in less than about 60 seconds to bond the die to the leadframe.

*E2* *5/27/97* 6. (five times amended) A method for packaging a semiconductor die to form a semiconductor package comprising:  
providing a leadframe comprising a plurality of lead fingers configured to support the die and configured to provide sites for wire bonding to the die;  
providing a cyanoacrylate adhesive material formulated to cure in contact with the die in less than about 60 seconds at a temperature of about 20°C to 30°C and in an ambient atmosphere;  
providing a filler in the adhesive material selected to improve a dielectric strength of the adhesive material in the package;  
applying the adhesive material to the leadframe or to the die;

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placing the die on the leadframe with the adhesive material compressed between the die and the leadframe to form an adhesive layer therebetween;

curing the adhesive material at the temperature and in the ambient atmosphere in less than about 60 seconds to bond the die to the leadframe;

wire bonding the die to the lead fingers; and  
encapsulating the die.

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12. (five times amended) A method for packaging a semiconductor die to form a semiconductor package, comprising:

providing a leadframe comprising a plurality of lead fingers configured for wire bonding to the die;

applying an adhesive material on the lead fingers or on the die, the adhesive material comprising a cyanoacrylate adhesive formulated to cure in contact with the die in less than about 60 seconds at a temperature of about 20°C to 30°C and in an ambient atmosphere, and an electrically insulating filler configured to increase a dielectric strength of the adhesive material;

placing the die on the lead fingers with the adhesive material in contact with the die and the lead fingers to form an adhesive layer therebetween;

curing the adhesive material at the temperature and in the ambient atmosphere in less than about 60 seconds to bond the die to the lead fingers;

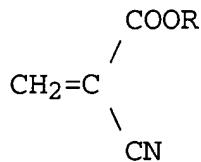
wire bonding the die to the lead fingers; and  
encapsulating the die.

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15. (four times amended) A method for packaging a semiconductor die to form a semiconductor package, comprising:

providing a leadframe configured for wire bonding to the die;

providing an adhesive material having the formula:



wherein R is a hydrocarbon group, the adhesive material formulated to cure in less than about 60 seconds in contact with the die at a temperature of about 20°C to 30°C and in an ambient atmosphere;

providing a filler in the adhesive material selected to tailor a characteristic of the adhesive layer in the package;

applying the adhesive material to the leadframe or to the die;

applying a catalyst to the leadframe or to the die;

placing the die on the leadframe with the adhesive material compressed between the die and the leadframe to form an adhesive layer therebetween;

curing the adhesive layer at the temperature and in the ambient atmosphere in less than about 60 seconds by interaction of the adhesive material with the catalyst to bond the die to the leadframe;

wire bonding the die to the lead frame; and

encapsulating the die.

~~E5~~ 21. (five times amended) A method for packaging a semiconductor die to form a semiconductor package comprising:

providing a leadframe configured for wire bonding to the die;

providing an adhesive material comprising an anaerobic acrylic formulated to cure in contact with the die in less than about 60 seconds at a temperature of about 20°C to 30°C and in an ambient atmosphere;

providing a filler in the adhesive material comprising a material selected from the group consisting of SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, AlN, Ag, Ni, Fe, SiC, and polystyrene coated Ni;

applying the adhesive material to the leadframe or to the die;

101 placing the die on the leadframe with the adhesive material compressed between the die and the leadframe to form an adhesive layer therebetween;

102 curing the adhesive material at the temperature and in the ambient atmosphere in less than about 60 seconds to bond the die to the leadframe;

103 wire bonding the die to the lead frame; and  
104 encapsulating the die.

42. (four times amended) A method for packaging a semiconductor die to form a semiconductor package, comprising:

105 providing a leadframe comprising a plurality of lead fingers configured to support the die and configured to provide sites for wire bonding to the die;

106 providing an adhesive material comprising an anaerobic acrylic formulated to cure in contact with the die in less than about 60 seconds at a temperature of about 20°C to 30°C and in an ambient atmosphere;

107 providing a filler in the adhesive material selected to improve the dielectric strength of the adhesive material in the package;

108 applying the adhesive material to the die or to the leadframe;

109 placing the die on the leadframe with the adhesive material in contact with the die and the leadframe to form an adhesive layer therebetween;

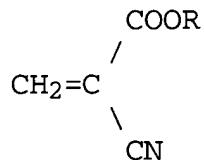
110 curing the adhesive material at the temperature and in the ambient atmosphere in less than about 60 seconds to bond the die to the leadframe;

111 wire bonding the die to the lead fingers; and  
112 encapsulating the die.

CLEAN VERSION OF ALL PENDING CLAIMS

1. (four times amended) A method for packaging a semiconductor die to form a semiconductor package comprising:
  - providing a leadframe configured for wire bonding to the die;
  - providing a cyanoacrylate adhesive material formulated to cure in contact with the die in less than about 60 seconds in a temperature of about 20°C to 30°C and an ambient atmosphere;
  - providing a filler in the adhesive material selected to tailor a characteristic of the package;
  - applying the adhesive material to the leadframe or to the die;
  - placing the die on the leadframe with the adhesive material in contact with the die and the leadframe to form an adhesive layer therebetween; and
  - curing the adhesive material in the temperature and the ambient atmosphere in less than about 60 seconds to bond the die to the leadframe.

2. (four times amended) The method of claim 1 wherein the adhesive material has the formula:



wherein R comprises a hydrocarbon group.

3. (thrice amended) The method of claim 1 further comprising applying a catalyst to the leadframe, to the die, or to the adhesive material prior to the curing step.

4. (four times amended) The method of claim 1 wherein the leadframe comprises a lead-on-chip leadframe and the filler is selected to increase a dielectric strength of the adhesive layer.

5. (thrice amended) The method of claim 1 wherein the filler is selected to improve thermal conductivity, mechanical strength, electrical conductivity, dielectric strength, moisture resistivity, or thermostability of the adhesive material in the package.

6. (five times amended) A method for packaging a semiconductor die to form a semiconductor package comprising:

providing a leadframe comprising a plurality of lead fingers configured to support the die and configured to provide sites for wire bonding to the die;

providing a cyanoacrylate adhesive material formulated to cure in contact with the die in less than about 60 seconds at a temperature of about 20°C to 30°C and in an ambient atmosphere;

providing a filler in the adhesive material selected to improve a dielectric strength of the adhesive material in the package;

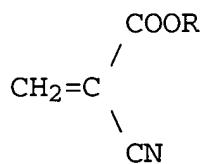
applying the adhesive material to the leadframe or to the die;

placing the die on the leadframe with the adhesive material compressed between the die and the leadframe to form an adhesive layer therebetween;

curing the adhesive material at the temperature and in the ambient atmosphere in less than about 60 seconds to bond the die to the leadframe;

wire bonding the die to the lead fingers; and  
encapsulating the die.

7. (four times amended) The method of claim 6 wherein the adhesive material has the formula:



wherein R comprises a hydrocarbon group.

8. (thrice amended) The method of claim 6 wherein the applying step comprises a method selected from the group consisting of syringe dispensing, stenciling, dip coating, spraying, and dot shooting.

9. (thrice amended) The method of claim 6 wherein the applying step comprises forming a plurality of dots of the adhesive material on the leadframe.

10. (thrice amended) The method of claim 6 wherein the filler comprises  $\text{SiO}_2$ .

11. (thrice amended) The method of claim 6 further comprising applying a catalyst to the leadframe, to the die, or to the adhesive material prior to the curing step.

12. (five times amended) A method for packaging a semiconductor die to form a semiconductor package, comprising:

providing a leadframe comprising a plurality of lead fingers configured for wire bonding to the die;

applying an adhesive material on the lead fingers or on the die, the adhesive material comprising a cyanoacrylate adhesive formulated to cure in contact with the die in less than about 60 seconds at a temperature of about 20°C to 30°C and in an ambient atmosphere, and an electrically insulating filler configured to increase a dielectric strength of the adhesive material;

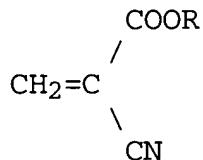
placing the die on the lead fingers with the adhesive material in contact with the die and the lead fingers to form an adhesive layer therebetween;

curing the adhesive material at the temperature and in the ambient atmosphere in less than about 60 seconds to bond the die to the lead fingers;

wire bonding the die to the lead fingers; and encapsulating the die.

13. (thrice amended) The method of claim 12 further comprising applying a catalyst to the lead fingers, to the die or to the adhesive material prior to the curing step.

14. (four times amended) The method of claim 12 wherein the adhesive material has the formula:

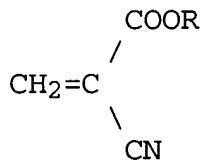


wherein R comprises a hydrocarbon group.

15. (four times amended) A method for packaging a semiconductor die to form a semiconductor package, comprising:

providing a leadframe configured for wire bonding to the die;

providing an adhesive material having the formula:



wherein R is a hydrocarbon group, the adhesive material formulated to cure in less than about 60 seconds in contact with the die at a temperature of about 20°C to 30°C and in an ambient atmosphere;

providing a filler in the adhesive material selected to tailor a characteristic of the adhesive layer in the package;

applying the adhesive material to the leadframe or to the die;

applying a catalyst to the leadframe or to the die;

placing the die on the leadframe with the adhesive material compressed between the die and the leadframe to form an adhesive layer therebetween;

curing the adhesive layer at the temperature and in the ambient atmosphere in less than about 60 seconds by interaction of the adhesive material with the catalyst to bond the die to the leadframe;

wire bonding the die to the lead frame; and  
encapsulating the die.

16. (thrice amended) The method of claim 15 wherein the catalyst comprises a compound selected from the group consisting of water and acid.

17. (thrice amended) The method of claim 15 wherein the filler comprises a material selected from the group consisting of  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{AlN}$ ,  $\text{Ag}$ ,  $\text{Ni}$ ,  $\text{Fe}$ ,  $\text{SiC}$ , and polystyrene coated  $\text{Ni}$ .

18. (thrice amended) The method of claim 15 wherein the leadframe comprises a mounting paddle for supporting the die.

19. (thrice amended) The method of claim 15 wherein the leadframe comprises a lead-on-chip leadframe comprising a plurality of lead fingers configured for wire bonding to the die and for supporting the die in the package.

20. (thrice amended) The method of claim 15 wherein the applying step comprises a method selected from the group consisting of syringe dispensing, stenciling, dip coating, spraying, and dot shooting.

21. (five times amended) A method for packaging a semiconductor die to form a semiconductor package comprising:

providing a leadframe configured for wire bonding to the die;

providing an adhesive material comprising an anaerobic acrylic formulated to cure in contact with the die in less than about 60 seconds at a temperature of about 20°C to 30°C and in an ambient atmosphere;

providing a filler in the adhesive material comprising a material selected from the group consisting of SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, AlN, Ag, Ni, Fe, SiC, and polystyrene coated Ni;

applying the adhesive material to the leadframe or to the die;

placing the die on the leadframe with the adhesive material compressed between the die and the leadframe to form an adhesive layer therebetween;

curing the adhesive material at the temperature and in the ambient atmosphere in less than about 60 seconds to bond the die to the leadframe;

wire bonding the die to the lead frame; and  
encapsulating the die.

22. (thrice amended) The method of claim 21 further comprising accelerating the curing step using ambient humidity on the leadframe or the die.

40. (twice amended) The method of claim 21 further comprising applying a catalyst to the leadframe, to the die, or to the adhesive material prior to the curing step.

42. (four times amended) A method for packaging a semiconductor die to form a semiconductor package, comprising:

providing a leadframe comprising a plurality of lead fingers configured to support the die and configured to provide sites for wire bonding to the die;

providing an adhesive material comprising an anaerobic acrylic formulated to cure in contact with the die in less than about 60 seconds at a temperature of about 20°C to 30°C and in an ambient atmosphere;

providing a filler in the adhesive material selected to improve the dielectric strength of the adhesive material in the package;

applying the adhesive material to the die or to the leadframe;

placing the die on the leadframe with the adhesive material in contact with the die and the leadframe to form an adhesive layer therebetween;

curing the adhesive material at the temperature and in the ambient atmosphere in less than about 60 seconds to bond the die to the leadframe;

wire bonding the die to the lead fingers; and  
encapsulating the die.

41. (twice amended) The method of claim 21 wherein the leadframe comprises a lead-on-chip leadframe comprising a plurality of lead fingers configured for wire bonding to the die and for supporting the die in the package.

43. (twice amended) The method of claim 42 wherein the leadframe comprises a lead-on-chip leadframe.

44. (twice amended) The method of claim 42 wherein the filler comprises SiO<sub>2</sub>.